Sept. 15, 1959 W. ENGEL 2,903,909

PITMANS OR LINKS FOR SEWING MACHINE TRANSMISSIONS

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Fig. 1

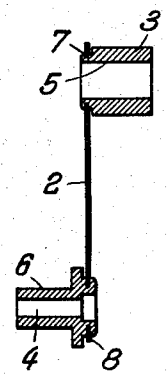


Fig. 2

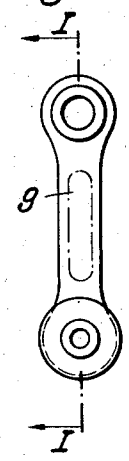


Fig. 3

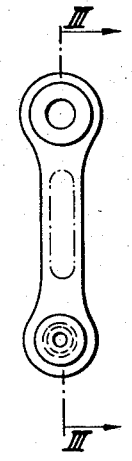


Fig. 4

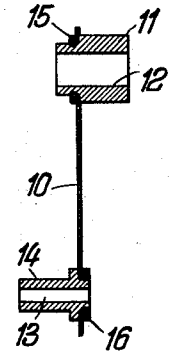


Fig. 5

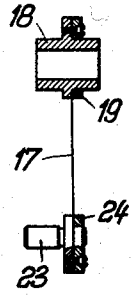


Fig. 6

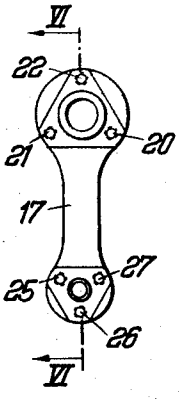


Fig. 7

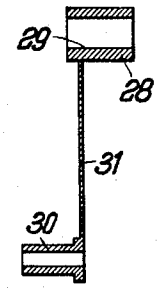
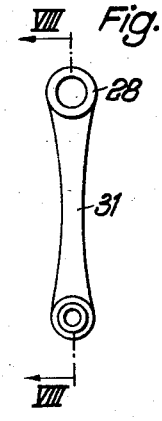


Fig. 8



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PITMANS OR LINKS FOR SEWING MACHINE TRANSMISSIONS

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Fig. 9

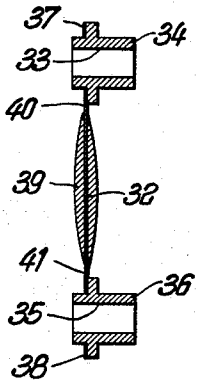


Fig. 10

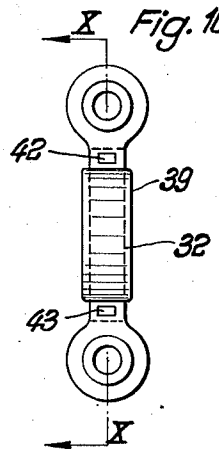


Fig. 11

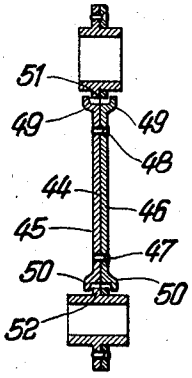


Fig. 12

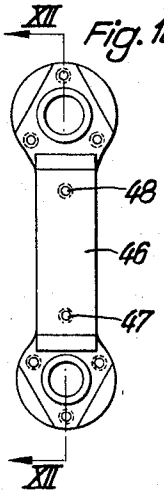


Fig. 13

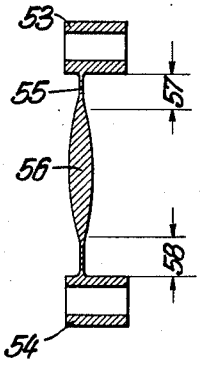


Fig. 14

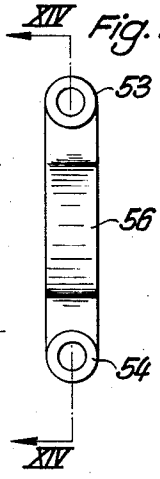


Fig. 16

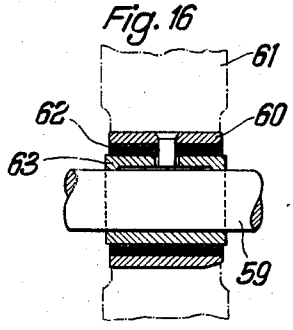
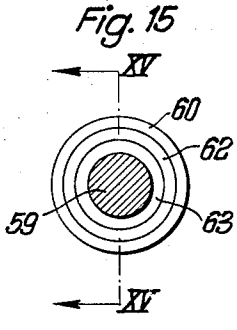


Fig. 15



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PITMANS OR LINKS FOR SEWING MACHINE TRANSMISSIONS

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Application June 14, 1956, Serial No. 591,348
Claims priority, application Germany June 14, 1955
8 Claims. (Cl. 74—581)

The invention relates to improvements in production methods for sewing machine driving components for the purpose of decreasing the production costs. The increased requirements as to the number of stitches and the noiselessness of the sewing machines compel higher wage and investment costs. These requirements could only be satisfied heretofore by closer tolerances and increased alignment accuracy of the operating components.

One way to obviate the alignment problem is to make individual transmission members, particularly guide links or connection links, elastically. Since the alignment errors occur as a rule in three planes, for example, with a rotating eccentric pin, the axis of which is not parallel to the axis of rotation, it is not sufficient to replace the eyes of the link which rotate about pins or studs with leaf springs which are screwed at the one end to the guide link and at the other to the part to be connected because such links yield only in two places. Likewise it is not sufficient to make a guide link elastic by making it, for example, of synthetic plastic, such as Polyamide.

The present invention relates to an arrangement for a link or pitman which obtains the universal mobility or articulation by means of a bridge made of an elastic material which has the axis of its longitudinal cross section extend perpendicular to at least one of the cylindrical bores of the two linkage eyes which engage the cylindrical studs of the parts to be connected by means of the link. To withstand only the tractive forces the bridge is provided with a cross section which admits twisting forces; however, when subjected to thrust forces, which need to be only a fraction of the tractive or pulling forces, the bridge flexes. In order to absorb both tractive and thrust forces the bridge has adjacent its ends a substantially unchanging cross section which permits twisting forces and is of such a length as the thrust loads are greater than the bending factor.

The link or pitman may, of course, be provided with bolts or studs instead of bores. For the elastic material it is possible to use, for example, spring steel, artificial plastic material, rubber, or a combination of these materials. The link or pitman arrangement, in accordance with the inventive concept may be made as a homogeneous unit or may be made of a plurality of parts. Thus, for example, when made as a single unit the device may be made of synthetic plastic. With multi-part embodiments of the invention the bridge encompasses the eyes of the joint. In order to insure great elasticity of the bridge in the presence of larger tractive and thrust forces, it may be made of thin bridge leaves placed upon one another in the manner of lamination. As mentioned hereinabove the bridge which absorbs the tractive and thrust forces should permit twisting at its ends in the proximity of the eyes; on the other hand, the bridge length which is disposed between the elastic ends must not bend as a result of the thrust loads. For this reason the bridge may be surrounded with a coating of artificial material such as plastic over this length of the bridge, or the bridge may be secured between reinforcement sheets. These reinforcement sheets are then suitably expanded at their ends and enclose a corresponding flange at the eyes of the pitman with tolerance therebetween in order to thus obtain the insurance against the bending end thrust loads which are too high.

In order to obtain an especially high elasticity of the bridge it may be provided over that length which permits twisting with variations of its cross section, such as perforations or recesses. When making pitmans of several parts the connection may be separable or solid. A solid connection, which may not be severed between the bridge and the eyes may be made, for example, by means of riveting, beading, dotting, or jacketing of the parts to be connected with artificial plastic or rubber. In forming the pitman of a plurality of severable parts the eyes which are encompassed by the bridge may suitably present a flange against which the bridge is placed with its eyes and by means of an annular disc. The bridge, however, may also be secured against the flange of the linkage eyes by means of a gripping ring.

An elastic pitman of this type permits alignment compensation in three places, is cheap to produce because in its production no particular alignment accuracy must be observed, it decreases the production costs of the component parts which cooperate with this pitman due to its three dimensional alignment balancing possibilities and because those parts can be made with substantially greater alignment inaccuracies as were permissibile heretofore. It also decreases the assembly time because the readjustment required on account of sluggish operation of the machine is eliminated and is lighter in weight as a rigid linkage, which is of importance in connection with high numbers of stitches.

Thus, for example, the thread lever joint of sewing machines may be made as a pitman in accordance with the principles of the invention; at one end of the linkage the eye is provided which is disposed with its bore around a bolt provided at the head of the arm, at the other end the linkage is provided with a stud, which enters into the upper bore of the thread lever. The stud and the eye of the linkage are rigidly connected with one another by means of a bridge of flexible material. It is suitable to make the bore which surrounds the crank stud of the thread lever longer than the horizontal distance of the thread eyelet of the thread lever to this bore, in order to provide the thread lever with a secure hold when the mass forces arise which are developed by the thread lever arm.

Inasmuch as in the construction of the thread lever joint as an elastic pitman no further axial forces are developed between the stud of the thread lever joint and the upper bore of the thread lever which surrounds it, the stud can be secured against axial displacement by means of a gripping ring.

Inasmuch as the elastic pitmans are particularly flexible in the direction of the bores they can advantageously serve as linkages between the stud of the pitman of the arm shaft and the needle bar block in zig-zag sewing machines.

In the needle bar joints known heretofore the universal articulation is obtained in that the cylindrical bores cooperate with spherical studs of the parts to be connected. Since this type of journalling is subject to heavy wear the cylindrical bore has been provided with a needle cage. It can be seen, however, that such journalling does not have the durability as an embodiment having a cylindrical bore and cylindrical stud. For that reason, journalling also became known where the bores were spherical. In such bores, bearing shells having a spherical outer surface are pivotally journalled. However, in order to enable the insertion of the bearing shells into the spherical bore the bores may not be long. As a rule, the length of

the bearing shell is smaller than the diameter of the studs of the parts to be connected and which it surrounds.

In order to enable enlargement of the bearing shell the eyes of the joint have already been made in several parts. All of these embodiments require great accuracy and possess several movable parts, and are therefore subject to wear and noise.

In order to minimize on the one hand the permanent bending factor of the elastic bridge and on the other hand the angle of deflection of the needle bar it is suitable to arrange the pivot axis approximately at half the height of the head of the arm. The location of the joint of rotation at a height between the upper joint of rotation of the needle bar block and the lower joint of rotation of the stud of the arm shaft has proven to be particularly advantageous.

A further means for decreasing the expenses are greater tolerances in bores and shafts if they do not introduce greater noise factors. It is therefore proposed in accordance with the invention to journal the arm shaft elastically in the arm within the limits permissible in accordance with sewing machine practice, particularly in the sewing machines which are provided with elastic pitmans the advancing or progressing of which is derived from the dog driving shaft and where the driving of the dog driving shaft is effected from the arm shaft by means of a belt. The arrangement of the pitman permits also the use of elastic bearing members for journalling the arm shaft. This elastic journal comprises a bearing, the inner ring of which surrounds the arm shaft, the outer ring of which is journalled in the bore of the arm and of an intermediate layer, for example, rubber, which rigidly connects the two rings.

The pitman arrangement is also applicable in other machines where the conditions are similar as in sewing machines.

Reference is now made to the drawings which illustrate embodiments of the invention and in which:

Fig. 1 shows a cross section of a thread lever link or pitman taken along the line I—I of Fig. 2 in the direction of arrows;

Fig. 2 is the front view of a thread lever link;

Fig. 3 shows the front view of a modified embodiment of a thread lever link;

Fig. 4 is a cross sectional view along lines III—III of Fig. 3 in the direction of the arrows;

Fig. 5 is a cross section of a further embodiment of a thread lever link taken in the direction of the arrows along line VI—VI of Fig. 6;

Fig. 6 is a front view of the thread lever link in accordance with Fig. 5;

Fig. 7 is a further embodiment of a thread lever link in section along line VIII—VIII of Fig. 8;

Fig. 8 is a front view of the thread lever link in accordance with Fig. 7;

Fig. 9 is a needle bar link in cross section along line X—X of Fig. 10;

Fig. 10 is a front view of the needle bar link in accordance with Fig. 9;

Fig. 11 is a cross section of an embodiment of a needle bar link taken along line XII—XII of Fig. 12;

Fig. 12 is a front view of the needle bar link in accordance with Fig. 11;

Fig. 13 is a sectional view of a further embodiment of a needle bar link taken along XIV—XIV of Fig. 14;

Fig. 14 is a front view of the needle bar link in accordance with Fig. 13;

Fig. 15 is the front view of an arm journal and

Fig. 16 is a section along line XV—XV of Fig. 15 taken in the direction of arrows.

Figs. 1–8 illustrate examples of a pitman arrangement subjected merely to tractive forces.

In Figs. 1 and 2 a thread lever link or pitman comprising several non-separable parts is illustrated. The bridge **2** of elastic material of the thread lever joint surrounds

the eye **3** by means of its bore **5**, as well as the projection **4** of the stud **6**. The eye **3** and the stud **6** are inseparably connected with the bridge **2** by means of the borders **7** and **8**. In order to increase the elasticity the perforation **9** may be provided which is shown in dot and dash lines.

Figs. 3 and 4 show a thread lever link or pitman consisting of several separable parts. The bridge **10** of the thread lever link made of elastic material surrounds the eye **11** provided with a bore **12** as well as the extension **13** of the stud **14**. The bridge **10** is secured on the eye **11** and the projection **13** against axial displacement by means of the retaining rings **15** and **16**.

A further thread lever link or pitman comprising several separable parts is shown, in Figs. 5 and 6. The elastic bridge **17** rests with its upper eye against a sleeve having a projection **18** and is held by means of a cover **19**, for example, with three countersunk screws **20, 21** and **22**. At the bottom the elastic bridge **17** is held with its eye at the projection of the bolt **23** and is likewise connected with a cover **24** by means of countersunk screws **25, 26** and **27**. A homogeneous embodiment of a thread lever link is shown by Figs. 7 and 8. The eye **28** with its bore **29**, the stud **30** and the bridge **31** are all made of the same material, preferably synthetic plastic material.

Examples of pitman arrangements which are adapted to absorb tractive and tensional forces are shown by Figs. 9–15. In Figs. 9 and 10 a needle bar link is illustrated which consists of several parts which are not separable. The bridge **32** of the needle bar link consisting of elastic material surrounds the eye **34** which presents the bore **33** as well as the eye **36** comprising the bore **35**.

The bridge **32** is spot welded to the flanges **37** and **38** of the eyes **34** and **36**. This bridge is surrounded by a coating of synthetic material **39** over such an extent of its length as the bending tension in the presence of thrust loads would be greater than the tractive loads in a bridge **32** which is not coated. The two bridge ends **40** and **41** which are not covered have a cross section which permits twisting. To increase the elasticity the bridge ends **40** and **41** may have perforations **42** and **43** .

Also the solution shown in accordance with Figs. 11 and 12 may be used. The elastic bridge of the needle bar link, which is made of several separable parts is connected in the same manner as described, in accordance with Figs. 5 and 6 at the connecting locations for example, by means of screws. The bridge **44** is here provided with several closely adjacent thin reinforcement blades **45** and **46** in the form of laminations and is connected for example by means of countersunk screws **47** and **48**. These reinforcement blades **45** and **46** are grooved at their ends **49** and **50** and enclose the flange at the eyes **51** and **52** of the pitmans with tolerances therebetween in order to achieve insurance against bending in the event of thrust loads which are too high.

An elastic embodiment of a needle bar link is shown in Figs. 13 and 14. The eyes **53** and **54** as well as the bridge **55** consist of the same material, preferably synthetic plastic. The bridge **55** has reinforcements **56** over such a length as bending tension in a bridge which is not reinforced would be greater under thrust loads than the thrust tension. The two ends of the bridge **57** and **58** which are not reinforced, have a cross section which permits twisting.

The use of the pitman arrangement in transmission components of the sewing machine permits the arm shaft **59** to be journalled elastically and thus in a noise suppressing manner, if the elasticity of the journalling is within the limits permitted in accordance with sewing machine design, the dog drive shaft is driven by the arm shaft by means of a belt and the advancing movement of the toothed head is derived from the dog drive shaft.

Such an elastic type of journalling is illustrated in Figs. 15 and 16. The outer ring **60** is arranged in the

sewing machine arm **61** which is shown in dash and dot lines. An intermediate layer **62** consisting of elastic material, for example, rubber, is rigidly connected with outer ring **60** and the inner ring **63** in which the arm shaft **59** is journalled.

Having now described my invention with reference to the various embodiments shown in the accompanying drawing, I do not wish to be limited thereto, but what I desire to cover by Letters Patent of the United States is set forth in the appended claims.

I claim:

1. A pitman or link structure for the drive mechanism of sewing machines comprising a pair of eye members having bores adapted to rotatably receive stud members and a bridge member connecting said eye members having a longitudinal cross sectional axis extending perpendicularly with respect to at least one of said bores, said bridge member being of elastic material and having a cross section adapted to yield to twisting movements and said bores being of a length greater than the thickness of said bridge adjacent said eyes.

2. A pitman or link structure for the drive mechanism of sewing machines comprising a pair of eye members having bores adapted to rotatably receive stud members and a bridge member connecting said eye members having a longitudinal cross sectional axis extending perpendicularly with respect to at least one of said bores, said bridge member being of elastic material having a substantially non-varying cross section adjacent its ends adapted to yield to twisting forces and having an enlarged cross-section along the central portion thereof intermediate said ends to resist forces of compression.

3. A pitman or link structure for the drive mechanism of sewing machines comprising a pair of eye members having bores adapted to rotatably receive stud members and a bridge member connecting said eye members having a longitudinal cross sectional axis extending perpendicularly with respect to at least one of said bores, said bridge member being of elastic material and having a cross section adapted to yield to twisting movements, said bores being of a length greater than the thickness of said bridge adjacent said eyes and said bridge encompassing said eye members to form a unitary structure.

4. A pitman or link structure for the drive mechanism of sewing machines comprising a pair of eye member having bores adapted to rotatably receive stud members and a bridge member connecting said eye members having a longitudinal cross sectional axis extending perpendicularly with respect to at least one of said bores, said bridge member being of elastic material having a substantially non-varying cross section adjacent its ends adapted to yield to twisting forces and of such longitudinal extent as the thrust loads are greater than the twisting stresses, and said bores being of a length greater than the thickness of said bridge adjacent said eyes.

5. A pitman or link structure for the drive mechanism of sewing machines comprising a pair of eye members having bores adapted to rotatably receive stud members and a bridge member connecting said eye members having a longitudinal cross sectional axis extending perpendicularly with respect to at least one of said bores, said bridge member being of elastic material having a substantially non-varying cross section adjacent its ends adapted to yield to twisting forces and of such longitudinal extent as the thrust loads are greater than the twisting stresses, said bores being of a length greater than the thickness of said bridge adjacent said eyes and said bridge encompassing said eye members to form a unitary structure.

6. A pitman or link structure for the drive mechanism of sewing machines comprising a pair of eye members having bores adapted to rotatably receive stud members and a bridge member connecting said eye members having a longitudinal cross sectional axis extending perpendicularly with respect to at least one of said bores, said bridge member being of elastic material and having a cross section adapted to yield to twisting movements, said bores being of a length greater than the thickness of said bridge adjacent said eyes, said bridge encompassing said eye members to form a unitary structure and being constituted of several blades disposed adjacent to one another in the manner of laminations.

7. A pitman or link structure for the drive mechanism of sewing machines comprising a pair of eye members having bores adapted to rotatably receive stud members and a bridge member connecting said eye members having a longitudinal cross sectional axis extending perpendicularly with respect to at least one of said bores, said bridge member being of elastic material and having a cross section adapted to yield to twisting movements, said bores being of a length greater than the thickness of said bridge adjacent said eyes, said bridge encompassing said eye members to form a unitary structure and being constituted of several blades disposed adjacent to one another in the manner of laminations and said eyes being separate parts presenting a flange against which the bridge is secured by means including annular disks and screws.

8. A pitman or link structure for the drive mechanism of sewing machines comprising a pair of eye members having bores adapted to rotatably receive stud members and a bridge member connecting said eye members having a longitudinal cross sectional axis extending perpendicularly with respect to at least one of said bores, said bridge member being of elastic material having a substantially non-varying cross section adjacent its ends adapted to yield to twisting forces and of such longitudinal extent as the thrust loads are greater than the twisting stresses and said bridge member being enclosed over said longitudinal extent in a shell of plastic material to permit twisting and insure against bending.

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